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(54) **Banding system for piled products and process**

(57) A banding system for piled products with a feed mechanism for feeding band material (2) from a supply roll (1), means for forming a loop (7) with said band material (2), welding means (14,15) to close said loop, said means for forming the loop comprising transporting means (11,13) for transporting the band material (2) around the product to be banded and vacuum means (19) connected to the transporting means. Said means for forming the loop (7) are movable with respect to the band feed mechanism to allow a transfer of products to be banded between the band feed mechanism and the means for forming the loop (7).

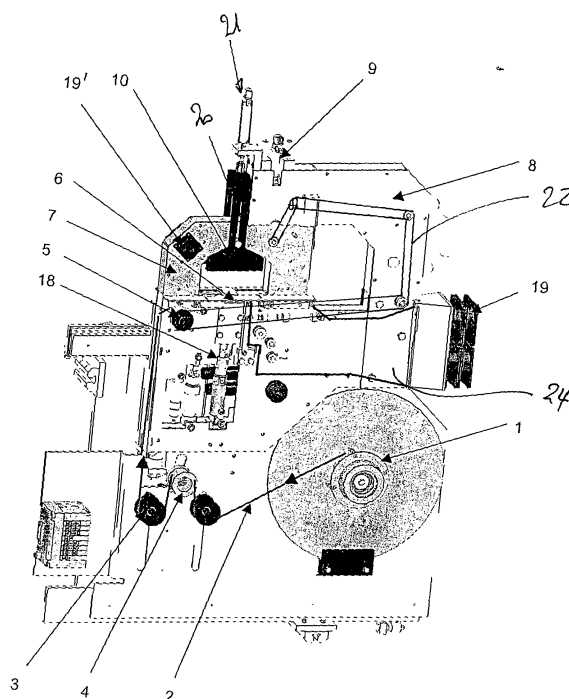


Fig. 1

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Description

[0001] The present invention concerns a banding system for piled products, such as piled sheets of paper.

[0002] The present invention also concerns a banding process for piled products, such as piled sheets of paper.

[0003] Such systems are known in the art, in particular in the art of fabricating securities made of paper substrate.

[0004] As a first example, US patent 3,939,621, the content of which is enclosed by reference in the present application, discloses a method of processing sheets of printed security papers into bundles and packets. In this known process, sheets with printed numbered banknotes are supplied to a cutting machine in piles of 100 sheets. After trimming of edges of the pile, successive strips are cut in the pile, each strip having several banknotes in a row. In the given example, each sheet contains 24 printed banknotes arranged in four columns and six rows, thus four strips are produced with six banknotes each. A further cutting unit is provided which then cuts the strips into individual piles of 100 banknotes. The individual piles of 100 banknotes are then individually banded in a banding unit to produce banded bundles of 100 notes consecutively numbered.

[0005] US patent N°4,283,902 discloses another process and apparatus for converting piles of freshly printed sheets of banknotes into bundles of banknotes. The machine disclosed comprises as many banding devices located in one row and operating simultaneously as there are individual banknotes per strip. Accordingly, the bundle strips are simultaneously provided with bands at all banknote positions, so that the bundles of banknotes leaving the last cutting tool are already bound and the narrow path which the banding station represented in the apparatus known hitherto is eliminated.

[0006] Another example is given by US patent 4,453,707, the content of which is incorporated by reference in the present application, which relates to a method and device for automatically processing sheet piles of numbered multiple-note security papers, such as banknotes, into bundle packets.

[0007] A further example of a banding device and banding process are disclosed in PCT application WO 95/19913, corresponding to US patent 5,755,084, both incorporated by reference in the present application. Said publications disclose a device for arranging a band of flexible material round at least one product, comprising a feed mechanism for feeding band material from a supply roll, means for forming a loop in an end portion of the band material round a space for receiving the product, means for severing that end portion and welding means for closing the loop, the means for forming the loop consisting of transporting means for the band material movable round the space and suction means connected to the transporting means.

[0008] In the described device, the band material is

pushed up via a guide by feed and pulling rollers and then comes into contact with a perforated endless conveyor belt. The belt, driven by a motor, is in a casing in which a vacuum pump creates underpressure (vacuum) in a channel engaging round the belt. The perforated belt thus draws the band material until the leading end of the band is clamped by a clamp. A space is surrounded by the band material, said space being larger than the product to be banded placed herein. Feed and pulling rollers then tighten the band material until the band material fits around the product, the band material coming loose from the perforated belt. Finally, cutting and welding means close the loop of band material and sever it from the remaining band material. The product banded can be removed and the machine is ready for the following cycle.

[0009] However, this machine is not practical when using it for banding a strip of notes in a simultaneous manner as is usual in the art of producing printed document such as securities. With several banding units arranged next to each other (as many banding units as single notes in the strip), the strip must be transported laterally under the successive banding units in order to be in place in banding position, which is very time consuming.

[0010] It is therefore an aim of the present invention to improve the known devices and methods.

[0011] In particular, an aim of the present invention is provide a simple banding device and process.

[0012] A further aim of the present invention is to provide a banding device and process that are more efficient.

[0013] Another aim of the present invention is to provide a banding system that can be placed in existing machines.

[0014] To this effect, the invention complies with the definition of the claims.

[0015] The invention will be best understood by the description of one embodiment thereof and of the accompanying drawings in which:

Figure 1 shows a general perspective view of the system according to the present invention.

Figure 2 shows a more detailed perspective view of the banding system.

Figure 3 shows a detailed view of the means for closing the loop.

[0016] In figure 1, a general perspective view of the banding system according to the invention is shown in partial cut. The system comprises mainly a band reel 1 from which a band 2 is taken and goes through a band storage comprising first 3 and second 4 storage rolls. The band is then guided to a drive roll 5, driven by a motor (not shown) which is under a band feed mechanism 6 through which the band is fed to means for form-

ing a loop 7. Said means for forming a loop 7 are attached to frame 8 of the machine and may be displaced upwards and downwards on said frame 8 through sliding rails means 9 integrated in said frame and this motion is driven, for example by appropriate displacement means, such as a piston.

[0017] Attached to the means for forming a loop 7 there is in addition a pressure means 10 formed, for example, by a pressure stamp, which may also have a relative motion of its own with respect to the means for forming a loop 7. The pressure stamp is guided on the means for forming a loop by a guiding aperture 20 and is moved by appropriate means, for example a piston 21. This pressure stamp 10 is used to apply pressure on the products being banded during the banding operation.

[0018] In figure 2, the feed mechanism 6 and the means for forming a loop 7 are disclosed in more detail. The feed mechanism comprises mainly the drive roll 5 which, at the same time drives the band 2 into the means for forming a loop 7, and also drives rolls 111 of the transporting means. The rotation of the drive roll 5 is synchronised with the rotation of the rolls 111 through a transfer belt referenced generally at 22 (see figure 1).

[0019] All rolls 111 are linked to each other by conveyor means 13, for example rubber rings (O-rings). The functioning of the transporting means is similar to the one of the device disclosed in WO 95/19913 and reference is made to this publication for description purposes. As described in this document, the transporting means are subject to vacuum through main vacuum pump 19 and auxiliary vacuum pump 19' and vacuum channel 24 (see figure 1) in order to press the band 2 against the conveyor means 13 and form the loop around the products. The path of the band 2 is schematically shown on figure 2 when forming the loop.

[0020] When the means for forming a loop 7 are lifted with respect to the feed mechanism along the rail means 9 (see figure 1), an opening is created on the left side of the system represented in figure 2, said opening allowing a transfer of a product to be banded from the left side of the system represented in figure 2 under the means for forming a loop 7.

[0021] The closing means for the loop are explained in more detail with reference to figure 3. The leading end of the band 2 is brought underneath a heating stamp counter piece 14, under which are situated a heating stamp 15, a blocking part 16 and a cutting means 17. Once the loop has been formed and the band forms an overlap under the counter piece 14, the assembly comprising heating stamp 15, blocking part 16 and cutting means 17 are displaced against counter piece 14 by suitable means for example of a piston 18 (figure 1). The blocking part 16 holds the band against the counter piece 14 and the cutting means 17 cuts the band 2 and the heating stamp 15 by application of heat closes the loop by welding. Once the welding is done, the piston 18 remove the assembly comprising heating stamp 15,

blocking part 16 and cutting means 17 and preferably, the means for forming a loop 7 are also removed with the pressure means 10.

[0022] The control of the proper closing of the band may now be carried out. Such a control can be carried out optically with a light ray controlling whether both ends of the loop are properly attached to each other.

[0023] If the loop is correctly closed, the banded products are now ready to be taken away, but still enclose the counter piece 14 in the loop of the band. Preferably, the banded products are moved laterally to be freed from the counter piece 14. To this effect, a transverse pusher is positioned at one end of the banded products and pushes laterally said banded products on a distance at least equal to the width of the band until the counter piece 14 is freed from the band. Once this movement has been carried out, the banded products may be taken away for further processing, such as trimming, cutting, collecting etc.

[0024] The transverse pusher can be actuated by appropriate means, for example by air under pressure.

[0025] Of course, the described embodiments of the machine a process are not to be construed in a limiting manner and are only given as examples. Equivalent means and steps can be derived from the present description.

Claims

1. A banding system for piled products, such as securities, banknotes, checks and other similar documents, with a feed mechanism for feeding band material (2) from a supply roll (1), means for forming a loop (7) with said band material (2), welding means (14,15) to close said loop, said means for forming the loop comprising transporting means (111,13) for transporting the band material (2) around the product to be banded and vacuum means (19) connected to the transporting means, wherein said means for forming the loop (7) are movable with respect to the band feed mechanism to allow a transfer of products to be banded between the band feed mechanism and the means for forming the loop (7).
2. A banding system as claimed in claim 1, wherein said means for forming the loop (7) are movable in translation with respect to the band feed mechanism.
3. A banding system as claimed in one of claims 1 or 2, wherein said transporting means comprise a plurality of transporting rolls (111) connected by conveyor means (13).
4. A banding system as claimed in one of claims 1 to 3, wherein said transporting rolls (111) and said feed mechanism are driven by a drive roll (5).

5. A banding system as claimed in one of claims 1 to 4, further comprising a pressure means (10).
6. A banding system as claimed in one of claims 1 to 5, wherein said conveyor means (13) are rubber rings. 5
7. A banding process for piled products, such as securities, banknotes, checks and other similar documents comprising the following steps: 10
 -) removing the means for forming a loop with band material with respect to a band feed mechanism;
 -) displacing products to be banded onto the band feed mechanism; 15
 -) bringing back said means for forming a loop;
 -) forming a loop of band material around said products;
 -) attaching the band material to form a closed loop; 20
 -) evacuating the banded products.
8. A banding process as claimed in claim 7, wherein the step of attaching the band material is made by welding or by glueing. 25
9. A banding process as claimed in claim 7 or 8, wherein it comprises a cutting step of the band product once the closed loop is formed. 30
10. A banding process as claimed in one of claims 7 to 9, wherein the removal of the means for forming a loop with band material with respect to the band feed mechanism is made by translation. 35
11. A banding process as claimed in one of claims 7 to 10, wherein before the evacuation of the banded products, the means for forming a loop with band material are removed with respect to the band feed mechanism. 40
12. A banding machine comprising a plurality of banding systems as defined in one of claims 1 to 6, said banding systems being placed one next to the other. 45

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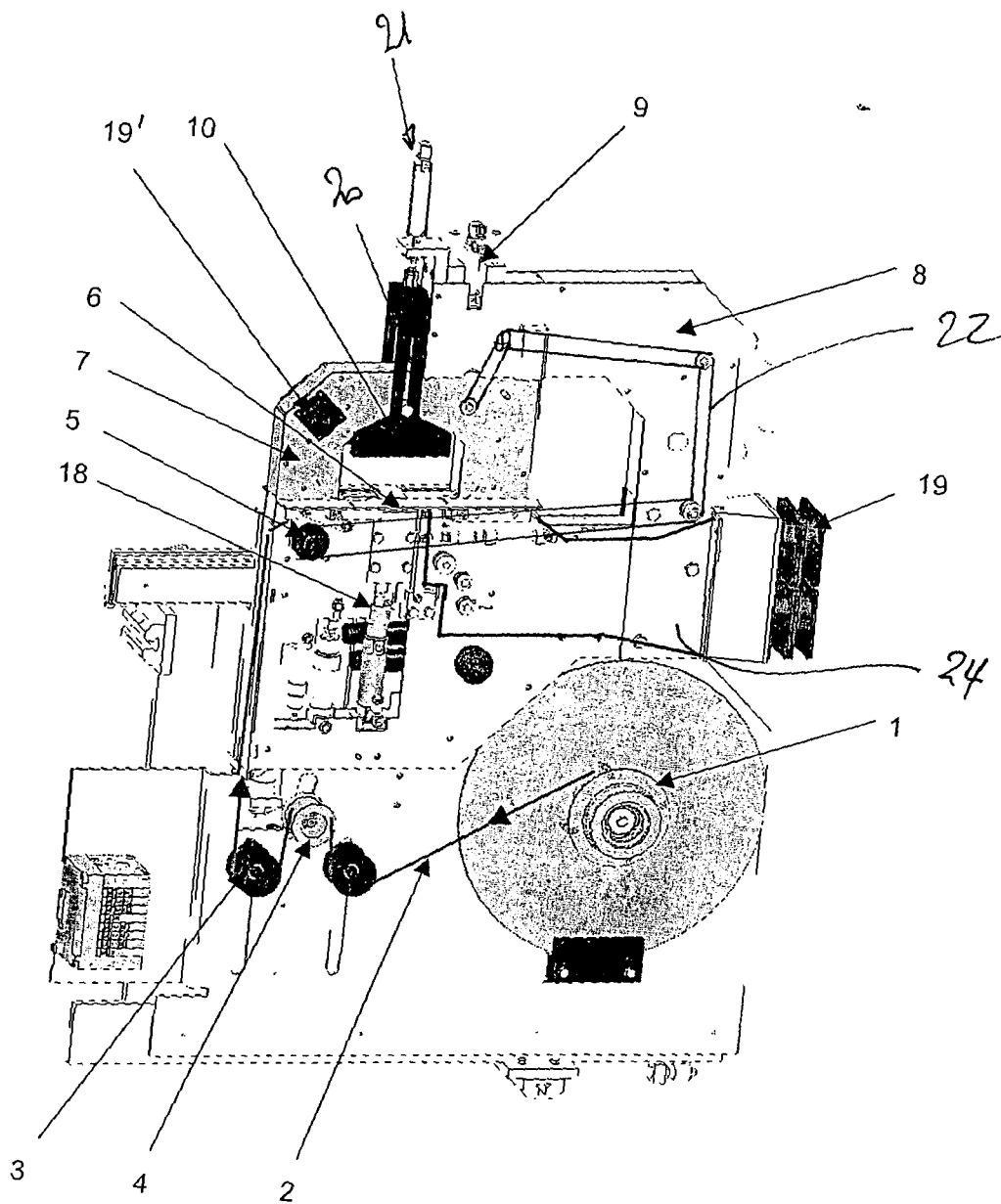


Fig. 1

Fig. 3

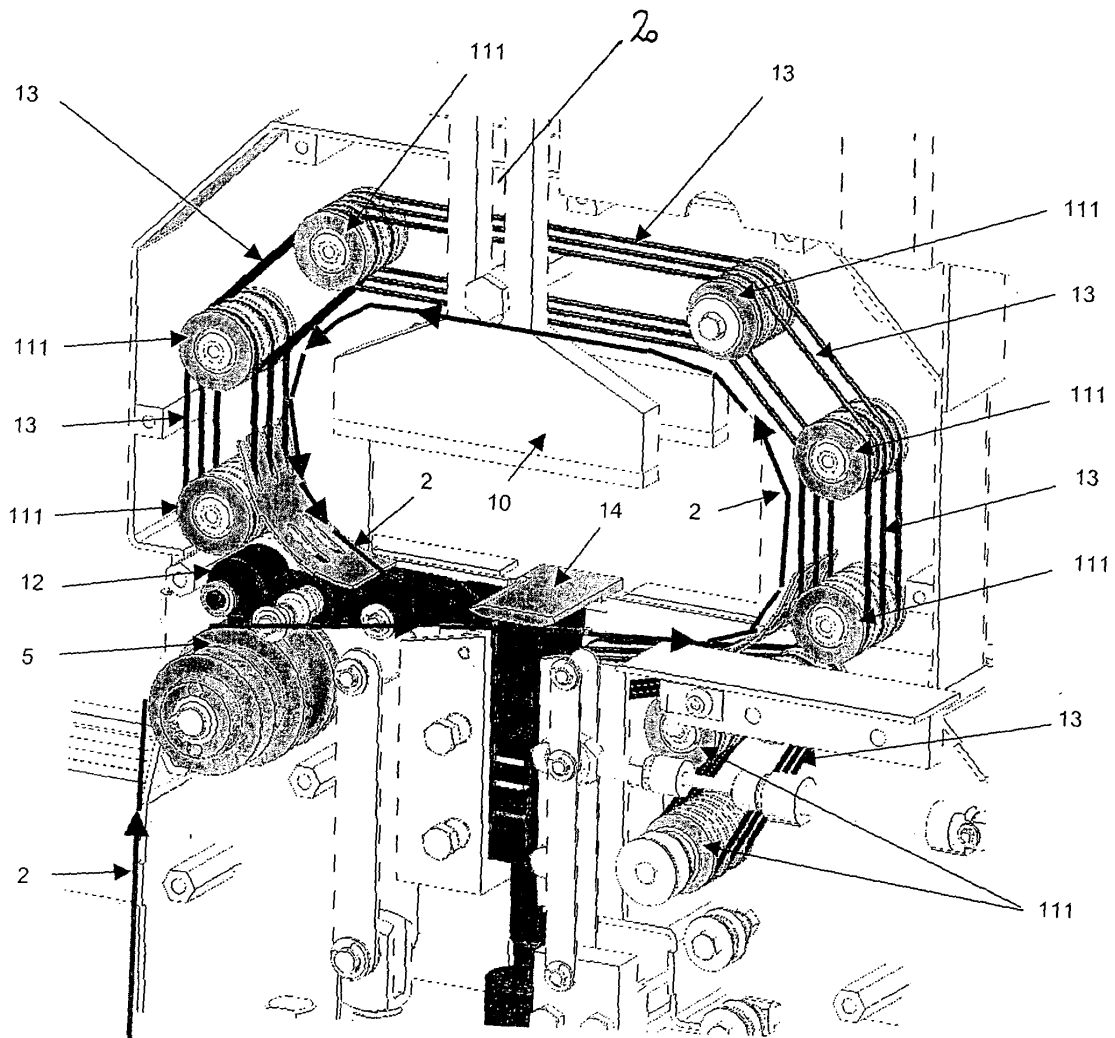
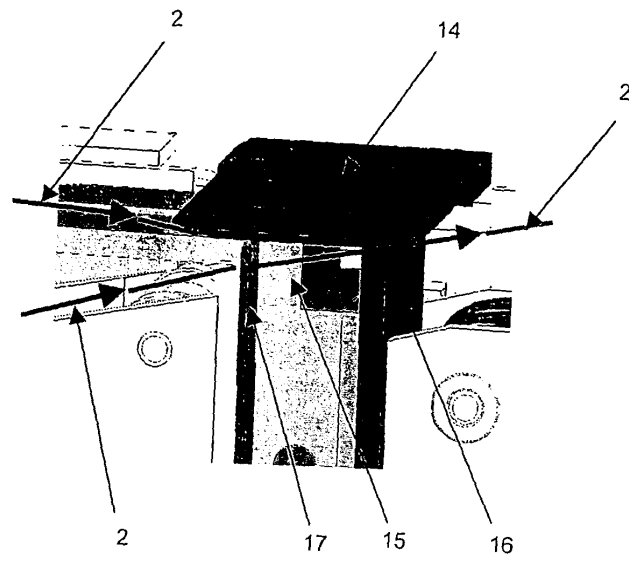


Fig. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 00 5269

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		6 July 2004	Vigilante, M
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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